4.2.7 Yield and Damage Surface Generation Analysis

Purpose: Initiate probing history so as to generate flow/damage surface plots

☞ **Note:** Currently this option is **only available** for continuous reinforcements, modid=1 see section **4.2.8**

☞ **FEAMAC Note: All the data on the SURF card is ignored by FEAMAC; option is meaningless in the context of finite element.**

⁕SURF
NPRE=*npre* ISP=*isp* IAN=*ian* C1=*c1* C2=*c2* C3=*c3* C4=*c4*

where:

npre - the number of preloading steps before probing for the yield surface begins (e.g., this is allows one to represent stress-free cooling)

isp - stress space
= 1 transverse-axial $(\sigma_{22} - \sigma_{11})$
= 2 transverse-transverse $(\sigma_{22} - \sigma_{33})$
= 3 shear-axial $(\sigma_{12} - \sigma_{11})$

ian - probe angle increment in degrees

"yield" criteria:

c1 - equivalent plastic strain, $\sqrt{\frac{2}{3}\Delta\varepsilon_{ij}^{i}\Delta\varepsilon_{ij}^{i}}$

c2 - Surface of Constant Dissipation Rate, SCDR, $\Sigma_{ij} \cdot \dot{\varepsilon}_{ij}^{i}$

c3 - Surface of Constant Inelastic Strain Rate, SCISR, $\dot{\varepsilon}_{ij}^{i} \cdot \dot{\varepsilon}_{ij}^{i}$

c4 - Surface of Constant Inelastic Power, SCIP, $\bar{\sigma} \cdot \Delta\bar{\varepsilon}^{i}$

☞ **Note:** Results from application of this option are described in: Lissenden C. J. and Arnold, S. M.; "Theoretical and Experimental Considerations in Representing Macroscale Flow/Damage Surfaces For Metal Matrix Composites", Int. Jnl. of Plasticity, Vol. 13, No. 4, pp. 327-358, 1997.

☞ **Note:** Upon fulfillment of each criteria (i.e., c1, c2, c3, and c4) the probe angle and stress vector are written to **output files** surf1.dat, surf2.dat, surf3.dat, and surf4.dat, respectively, for post processing by the user.

☞ **Note:** Probing continues until all four criteria are satisfied or the specified load history is completed for a given probe angle. Thus, to render a particular criterion inactive, use a value of 0 for the criterion so it is fulfilled immediately, thereby rendering the associated output meaningless. Also, it is suggested that a large load history be imposed to ensure yielding along a given probe angle occurs.